

**BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT**

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN

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Course Code

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Fourth Semester B.E. Degree Examinations, July 2026

**POWER ELECTRONICS**

Duration: 3 hrs

Max. Marks: 100

**Note:** 1. Answer any FIVE full questions choosing ONE full Question from each Module.  
2. Missing data, if any, may be suitably assumed

| <u>Q. No</u>           | <u>Question</u>                                                                                                                                                                                                                       | <u>Marks</u> | <u>(RBTL:CO: PI)</u> |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------|
| <b><u>Module-1</u></b> |                                                                                                                                                                                                                                       |              |                      |
| 1.                     | a. What is power electronic converter system? Draw the block diagram and mention any four applications of system.                                                                                                                     | 10           | (2 : 1 : 1.4.1)      |
|                        | b. Mention various types of power semiconductor devices. Draw the VI characteristics and symbols of any five types. Mention their important applications.                                                                             | 10           | (2 : 1 : 1.4.1)      |
| (OR)                   |                                                                                                                                                                                                                                       |              |                      |
| 2.                     | a. Define and derive the expressions for the reverse recovery current and reverse recovery time of power diode.                                                                                                                       | 10           | (2 : 1 : 1.4.1)      |
|                        | b. With a neat circuit diagram and waveforms explain the switching characteristics of power diode                                                                                                                                     | 10           | (2 : 1 : 1.4.1)      |
| <b><u>Module-2</u></b> |                                                                                                                                                                                                                                       |              |                      |
| 3.                     | a. With necessary waveforms explain the switching characteristics of power transistor.                                                                                                                                                | 10           | (2 : 2 : 1.4.1)      |
|                        | b. What is the necessity of base drive control in high power transistor? Explain anti-saturation base control technique to improve the performance of BJT.                                                                            | 10           | (2 : 2 : 1.4.1)      |
| (OR)                   |                                                                                                                                                                                                                                       |              |                      |
| 4.                     | a. Describe di/dt and dv/dt protection for transistor.                                                                                                                                                                                | 10           | (2 : 2 : 1.4.1)      |
|                        | b. With a neat waveforms explain the switching characteristics of MOSFET.                                                                                                                                                             | 10           | (2 : 2 : 1.4.1)      |
| <b><u>Module-3</u></b> |                                                                                                                                                                                                                                       |              |                      |
| 5.                     | a. Explain various methods of turn ON used for thyristors.                                                                                                                                                                            | 10           | (2 : 3 : 1.4.1)      |
|                        | b. Using two transistor model, explain how a small gate current can turn on the SCR when blocking forward voltage.                                                                                                                    | 10           | (2 : 3 : 1.4.1)      |
| (OR)                   |                                                                                                                                                                                                                                       |              |                      |
| 6.                     | a. Design the values of di/dt inductor and RC snubber components for an SCR working in 230 V system. Given di/dt rating is 90 A/μs and dv/dt rating is 200 V/μs. Effective series resistance is 1.5 Ω. Consider damping factor is 0.6 | 10           | (3 : 3 : 1.4.1)      |

**Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI- Performance Indicator)**

- b. With a neat circuit diagram and waveforms explain UJT triggering circuit. 10 (2 :3 : 1.4.1)

#### **Module-4**

7. a. Derive an expression for average and RMS value of output voltage for 1-phase half wave controlled rectifier for R-load. 10 (2 :4 : 1.4.1)
- b. For a single phase dual converter, obtain an equation for circulating current  $i_{cir}$ . 10 (3 :4 : 1.4.1)

**(OR)**

8. a. With a neat circuit diagram and waveforms explain single phase controllers with resistive load. 10 (2 :4: 1.4.1)
- b. Explain the principle of phase control. Obtain an expression for rms value of output voltage. 10 (3 :4 : 1.4.1)

#### **Module-5**

9. a. Explain the basic principle of operation of step down chopper with RLE load, with necessary circuit diagram and waveforms. 10 (2 :5 : 1.4.1)
- b. With the help of circuit diagram and quadrant diagram, explain the working of class E chopper. 10 (2 :5 : 1.4.1)

**(OR)**

10. a. Explain performance parameters of an inverter. 10 (2 :5 : 1.4.1)
- b. Explain the operation of 1-phase full bridge inverter for R-load. 10 (2 :5 : 1.4.1)

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